Technical correspondence

Computers aren't people

Dr. John Pierce writes in his article on "Men, Machines, and Languages" (July, pp. 44–49) that "progress with computers has come through employing their useful potentialities . . . But the sort of performance the artificial intelligence enthusiasts have worked toward hasn't proved useful."* He then goes on to offer some evidence to support his conjecture saying, "computers have been miserable at theorem proving, music composing (at least we don't enjoy their compositions—maybe computers do), chess playing, and general pattern recognition." Finally, he states, "In view of the tremendous usefulness of computers, all I can say about their failures in these fields is, so what?"

To my mind this is a rather strange view, since even if I were to grant his hypothesis that there have been failures in these fields, all I can say about the *tremendous usefulness* of computers is, so what? Most people already know that computers are useful. Indeed, taking a more philosophical bent, the only interesting questions to be asked about computers concern their fundamental limitations. And this leads us directly back to the field of artificial intelligence. It seems to me that in the computer field, as in any field, one tends to solve easy problems before hard ones; and in my opinion the ostensible failures in artificial intelligence derive from the fact that problems in this field are inherently more difficult than problems in other areas of computer application for which solutions have been found. It seems to me to be premature to draw any conclusions about the *potential* usefulness of theorem proving, music composing, chess playing, and pattern recognition based on the current performance of programs designed to perform these tasks. Furthermore, it is a matter of opinion as to whether current performance at these tasks has been miserable (I could argue strongly to the contrary); but even assuming this outlook, I feel it is a grave disservice to characterize efforts in these areas as failures. It seems that a more constructive attitude toward artificial intelligence is (1) hard problems take longer than easy problems; (2) significant progress in artificial intelligence has already been made†; (3) there are no obvious barriers to continued progress; and (4) once some of these problems are solved, the benefits in terms of utility will be enormous.

There are also some misleading remarks in the section on language. Dr. Pierce correctly observes that attempts to characterize the relation between syntax and semantics in processing natural language statements has met with considerable difficulty. He then states, "No doubt, syntax comes into the understanding of speech, but meaning seems somehow to come first." My own research on natural language processing leads me to a somewhat different conclusion. Although syntax and semantics ought to remain recognizably distinct components of any natural language processing system, I believe these components should be highly interactive in the processing of any statement. It seems that any approach that argues that syntax begins where semantics leaves off, or conversely, that semantics begins where syntax ends, is ultimately doomed to failure. This interrelation between syntax and semantics is not intended as an apologetic compromise between contending proposals, but as a precise reflection of the facts of language.

Finally, we come to the section entitled, "Where do we go from here?" Instead of awakening the engineering community to some really important possibilities and their consequences (some of which will shortly be within the state of the art) this article does its greatest disservice by lulling us into complacency about future prospects. This section essentially reinforces the following simplistic argument: (1) human beings are wonderful! (we can open things we've never seen before, we can perform the "miracle" of responding to instructions phrased in

*Notice how the wording tempts one to draw the erroneous conclusion: therefore, workers in artificial intelligence can make no progress.

†Although I could document this claim by citing a large number of programs in each of the above-mentioned fields, I refer the interested reader to the ACM SIGART *Newsletters*, nos. 1–10.

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broad concepts., etc.); (2) computers do miserably at tasks that are trivial for people (pattern recognition, resolving ambiguity, etc.); (3) substantive progress on known problems has been slow (so far, the results have been more startling than useful); (4) there are still some extremely difficult problems ahead to which little attention has been paid (such as forming a map of even a portion of the real world); *therefore*, (5) we are not likely in the near future (if ever) to "succeed very well in making computers interact usefully with natural languages."

Although the first four premises are all more or less true, their relationship to the conclusion is somewhat tenuous. Indeed, I am already prepared to offer a counterexample to this conclusion. For the last three months we have been experimenting with a deductive question-answering system in the Stanford Research Institute Information Science Laboratory capable of accepting English sentences (declarative, interrogative, and imperative) taken from a restricted subset of natural language in a conversational manner and usefully acting on them in conjunction with a "map" of the world automatically generated by various sensors, including a television camera. A fuller discussion of the capabilities of this system can be found in an article by L. S. Coles entitled "An On-Line Question-Answering System with Natural Language and Pictorial Inputs" that was presented at the ACM Conference in Las Vegas, Nev., August 27, 1968, and might form the basis for a future SPECTRUM article with the same title.

L. Stephen Coles
Stanford Research Institute
Menlo Park, Calif.

To an engineer, Dr. L. Stephen Coles' statement that "the only interesting questions to be asked about computers concern their fundamental limitations" seems rather negative. Would one say the same thing about man? What about wonderful and far from fully exploited capabilities of computers?

Certainly, sensible people (excluding some philosophers) start with easy problems and progress toward harder problems. That's how progress is made. Computers and computer applications are progressing thrillingly as well as usefully in just this way. I don't observe that this is so of what goes on under the name "artificial intelligence." Further, I just don't believe that "once

these problems are solved" (whatever those problems may be) "the benefits in terms of utility will be enormous." I've heard that sanctimonious cant for so long that I'm getting deaf to it.

As to syntax and content, they certainly can't get along entirely independently, although we continually use and understand ungrammatical sentences, and experiments carried out by Joseph Danks at Princeton showed that subjects could get at the meaning of statements whose words had been scrambled into an order that was syntactically wrong, and they could put the words back in their original correct order.

I think human beings are wonderful, and I think that computers are wonderful, too. Computers do many things that human beings can't do. And I never said that computers won't handle natural languages effectively for some limited purposes; I think that they will. I only said that they need a map of the world, or of a field, to do so. How wonderful if we could find a task of this sort that was both useful and easy.

Computers look silly only when someone tries to make them walk on their hind legs and beg to be recognized as people. There should be a Society for the Prevention of Cruelty to Computers to deal with this abuse.

J. R. Pierce
Bell Telephone Laboratories, Inc.
Murray Hill, N.J.

To convert or not to convert

I have read the article on railroad electrification in the July issue and found it somewhat interesting historically but extremely irritating otherwise. Why did the author take all the trouble to convert miles to kilometers and km/h? He obtained his information from the references as indicated at the end of the article and no doubt had quite an interesting time converting distances from miles to kilometers. All the references mentioned used miles or miles per hour, so why the change? All maps in the U.S. use the mileage system and car speedometers still use mi/h.

I have for a long time been mildly annoyed with the use of the designation Hz. Cycles has been good enough for many decades and I think it a little late to honor Mr. Hertz. It was not necessary to conform to other countries. I am sure the original AIEE would not have agreed to the change.

With regard to the general makeup of IEEE SPECTRUM I would suggest you look over some of the old issues of the AIEE. They were good.

A. A. Jeffery
Los Angeles, Calif.

In the August 1968 issue of IEEE SPECTRUM (pp. 34–45) F. A. Ritchings of Ebasco Services Inc., in an article entitled "Raw Energy Sources for Electric Generation," several times uses the term Btu without giving the corresponding International System Unit each time.

It would help the international community very much if the corresponding S.I. unit would always follow the English unit.

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